

24/11 '02 09:43 FAX +43 1 513 47 76
NOV-22-2002 17:01

BURNS DORNE

DR. FERDINAND GIBLER

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Patent
Attorney's Docket No. 032287-001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of)	
Johann PFEIFFER)	Group Art Unit: 2664
Application No.: 08/981,519)	Examiner: Steven Nguyen
Filed: March 17, 1998)	
For: METHOD AND BI-DIRECTIONAL DATA TRANSMISSION OVER A TWO-WIRE LINE)	

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DECLARATION OF JOHANN PFEIFFER PURSUANT TO 37 C.F.R. § 1.132

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I, Johann Pfeiffer, hereby declare to the best of my recollection as follows:

1. I am an employee at Ericsson Austria AG, and my present position is a Senior Design Engineer. I attended the Technical University of Austria, where I received a degree as a Graduate Engineer (Dipl.-Ing). I have 12 years of experience in the field of communications, and in particular in algorithm design and DSP-based modem design. I have personal experience in the design of voice band modems, echo cancellation, trellis coding, baseband modems, full duplex Discrete Multitone (DMT) modems with echo cancellation and DMT modems which operate in time division multiplexing mode. I am familiar with the state of the communications art on June 21, 1996 when the above-identified patent application, Serial No. 08/981,519 was filed.

2. I have read and understand the contents of U.S. Patent Application Serial No. 08/981,519.

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3. At the time of the invention DMT was the type of modulation selected for use in Asymmetric Digital Subscriber Line (ADSL) communications.

4. At the time of the invention, ADSL communications were in the process of being standardized by the American National Standards Institute (ANSI) and by the European Technical Standards Committee (ETSI). The result of these processes was the issuance of the T.1.413 standard by ANSI, and the G.992.1 standard by ETSI. The working documents which existed at the time of the invention which resulted in the issuance of these standards will be jointly referred to as "the working versions of the standards".

5. At the time of the invention, the working versions of the standards required the use of Frequency Division Multiplexing (FDM) or echo cancellation for separating upstream and downstream transmissions.

6. In both the upstream and downstream frequency channels, the working versions of the standards required the use of consecutive 250 microsecond blocks.

7. Due to the nature of DMT modulation and the electrical characteristics of twisted pair conductors, a prefix time is required at the beginning of each block to allow time for the previous block signals to fade out and for the current block signals to enter a steady state. If the prefix time is not set to a long enough period of time, any remaining signal transients from the previous block can cause bit errors to the subsequent block.

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8. The working versions of the standards specified a 14.49 microsecond prefix time.

9. When upstream and downstream channels of DMT modulated information are separated by time division multiplexing, the line delay between the source and destination must be accounted for in setting the prefix time.

10. I determined that the prefix time for separating upstream and downstream channels which carry DMT modulated information by time division multiplexing can be determined using the following formula:

$$2 * T_{\text{delay}} + T_{\text{transients}} < T_{\text{prefix}}$$

11. A typical line delay is approximately 5 microseconds/km, a typical loop range is approximately 4-5 km, and a typical transient duration is approximately 60-80 microseconds employing conventional equalizers, and 15-20 microseconds using high quality equalizers. Based on these typical values, the prefix time to separate upstream and downstream channels carrying DMT modulated information by time division multiplexing is approximately 55 microseconds with high quality, complex, and expensive equalizers, and approximately 100 microseconds with typical equalizers.

12. Using the block time of 250 microseconds specified in the working version of the standards, to separate upstream and downstream channels carrying DMT modulated information by time division multiplexing would increase the prefix time from 5.796% of

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the 250 microsecond block time (based on the prefix length specified in the working versions of the standards) to 22% of the 250 microsecond block time (based on the prefix length using a high quality equalizer), or 40% of the 250 microsecond block time (based on the prefix length using a typical equalizer).

13. At the time of the invention one of ordinary skill in the art would have considered a prefix time which is 22-40% of the block time to be an inefficient use of bandwidth, even accounting for the advantages provided by DMT modulation.

14. In the communications art it is well known that to achieve widespread acceptability of a product it is highly desirable for the product to conform to a standard established by ANSI or ETSI. It was also well known that it would have been highly desirable to conform products to working versions of standards since many portions of the working versions were incorporated into the finalized version of the standards.

15. In view of the block time provided by the working versions of the standards, at the time of the invention, one of ordinary skill in the art would have considered it impractical to separate upstream and downstream channels carrying DMT modulated information by time division multiplexing.

16. I have read and understood the disclosure of U.S. Patent No. 5,619,505 to Grube et al. ("Grube").

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17. The disclosure of Grube clearly describes a system that conforms to the working versions of the standards.

18. The disclosure of Grube does not disclose separating upstream and downstream channels carrying DMT modulated information by time division multiplexing. Instead, the Grube system relies on echo cancellation to separate the upstream and downstream channels.

19. The disclosure of Grube does not suggest, nor does it provide any guidance with respect to separating upstream and downstream channels carrying DMT modulated information by time division multiplexing.

20. In view of Grube's disclosure of a system which operates according to the working versions of the standards, and in view of the prefix time requirements of separating upstream and downstream channels carrying DMT modulated information by time division multiplexing, at the time of the invention one of ordinary skill in the art would have considered it impractical to modify Grube's system to separate upstream and downstream channels carrying DMT modulated information by time division multiplexing.

21. To implement time division multiplexing of upstream and downstream channels carrying DMT modulated information, the present invention departs from the working versions of the standards and employs a 625 microsecond block time.

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22. Using a 625 microsecond block time of the present invention, a prefix time to accommodate high quality equalizers (i.e., a 55 microsecond prefix time) accounts for only 8.8% of the block time, while a prefix time to accommodate typical equalizers (i.e., a 100 microsecond prefix time) accounts for only 16% of the block time.

23. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful and false statements may jeopardize the validity of the application or any patent issued thereon.

Executed On . . . VienNA, 2002-NOV-22


Johann Pfeiffer

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